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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/628,477	07/31/2000	Patrick H. Dussud	MS146913.1/40062.79-US-01	5539

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EXAMINER	
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ART UNIT	PAPER NUMBER
2172	

DATE MAILED: 12/03/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/628,477	DUSSUD, PATRICK H.	
	Examiner	Art Unit	
	Anh Ly	2172	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *31 July 2000* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *3 & 4* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1. Claims 1-20 are pending in this application.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in-
> (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
> (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

3. Claims 1-20 are rejected under 35 U.S.C. 102(e) as being anticipated by US Patent No. 6,289,360 issued to Kolodner et al. (herein Kolodner).

With respect to claim 1, Kolodner discloses logically dividing the memory into a plurality of heaps, each heap dedicated to one processor for garbage collection (locations of heap means as plurality of heaps in the memory: col. 2 lines 60-65; also col. 1, lines 57-60 for garbage collection heaps); performing a plurality of garbage collection phases (mark and sweep phases: col. 2, lines 1-18), wherein each processor having a dedicated heap, each processor performs each of the phases on the heap

dedicated to the processor using a garbage collection thread executing on the processor (collector threads to force synchronization process: col. 3, lines 25-45 and col. 5, lines 4-14); and synchronizing the processors so that all processors have completed the preceding phase prior to each processor beginning the next phase (the beginning phase and the ending phase of the mark-sweep cycle and the synchronization process is between the mark-sweep phases: abstract, col. 2, lines 57-67; also col. 3, lines 25-45 and col. 5, lines 44-61).

With respect to claim 2, Kolodner discloses for each processor performing a phase of the garbage collection process, upon completion of the phase of the garbage collection process waiting for the other processors to complete the phase of the garbage collection process (col. 10, lines 8-18 and lines 48-55); and once the other processors have completed the phase of the garbage collection process, beginning the next phase of the garbage collection process (col. 5, lines 44-61; also col. 2, lines 32-42).

With respect to claim 3, Kolodner discloses a marking phase that marks all reachable objects in memory; a planning phase that plans the relocation of the objects; a relocation phase that updates the object references based on information calculated by the planning phase; and a compaction phase that compacts the reachable objects in memory (collection mark-sweep cycle: see fig. 7; also fig. 6, col. 10, lines 8-47, see abstract and fig. 10, col. 11, lines 25-31).

With respect to claim 4, Kolodner discloses analyzing each memory object to retrieve references to other memory object; if a reference to another memory object is

present, analyzing the reference information to determine which heap the referenced object is associated; analyzing the directory of the heap for the referenced object to determine a new address location of the referenced object; and updating the reference information in the memory object (col. 10, lines 8-47, col. 11, lines 65-67 and col. 12, lines 1-12).

With respect to claim 5, Kolodner discloses stopping executing process threads (col. 3, lines 26-28); initiating parallel marking threads in each processing unit associated with a heap, wherein one thread executes within each processing unit and wherein the marking threads mark the reachable objects in the shared memory (col. 2, lines 57-67 and col. 3, lines 1-45); upon completion of all marking threads, initiating parallel planning threads in each processing unit associated with a heap, wherein one thread executes within each processing unit and wherein each planning thread plans the new locations for objects within the associated heap (col. 6, lines 18-33, see fig. 2 and col. 8, lines 9-30); upon completion of all the planning threads, initiating parallel relocating threads in each processing unit associated with a heap, wherein one thread executes within each processing unit and wherein each relocating thread updates internal object references based on the new locations determined by the planning threads, the relocation threads updating information for objects within the associated heap; and upon completion of all the relocating threads, initiating parallel compacting threads in each processing unit associated with a heap, wherein one thread executes within each processing unit and wherein each compacting thread updates moves

objects within the associated heap to the new locations determined by the planning threads (col. 5, lines 62-67, col. 6, lines 1-7 and col. 11, lines 25-31, see figs. 9 and 10).

With respect to claim 6, Kolodner discloses analyzing each memory object to retrieve references to other memory objects; if a reference to another memory object is present, analyzing the reference information to determine which heap the referenced object is associated; analyzing the directory of the heap for the referenced object to determine a new address location of the referenced object; and updating the reference information in the memory object (col. 10, lines 8-47, col. 11, lines 65-67 and col. 12, lines 1-12).

With respect to claim 7, Kolodner discloses wherein the marking threads mark objects independently of the heap boundaries (abstract, col. 10, lines 65-67 and col. 11, lines 1-25).

With respect to claims 8-9, Kolodner discloses wherein all the processing units associated with the computer system are associated with a heap and wherein the heaps comprise a contiguous set of memory objects within the shared memory (col. 4, lines 39-59 and col. 6, lines 55-60 and col. 7, lines 1-15).

With respect to claim 10, Kolodner discloses for each processing unit associated with a heap: a marking module executing a marking phase that marks reachable objects within the shared memory; a planning module for executing a planning phase that plans the relocation the memory objects within the associated heap following the marking of all reachable objects; a relocating module for executing a relocating phase that updates the object references within objects of the associated heap following the planning of the

relocation; a compacting module for executing a compacting phase that moves the memory objects of the associated heap following the updating of the object references; and a rendezvous module for determining whether all processing units in the system have completed each preceding phase before starting the next phase (collection mark-sweep cycle: see fig. 7; also fig. 6, col. 10, lines 8-47, see abstract and fig. 10, col. 11, lines 25-31; col. 3, lines 25-45 and col. 5, lines 44-61).

Claim 11 is essentially the same as claim 1 except that it is directed to a computer program product readable by a computer rather than a method (locations of heap means as plurality of heaps in the memory: col. 2 lines 60-65; also col. 1, lines 57-60 for garbage collection heaps; mark and sweep phases: col. 2, lines 1-18; collector threads to force synchronization process: col. 3, lines 25-45 and col. 5, lines 4-14; the beginning phase and the ending phase of the mark-sweep cycle and the synchronization process is between the mark-sweep phases: abstract, col. 2, lines 57-67; also col. 3, lines 25-45 and col. 5, lines 44-61), and is rejected for the same reason as applied to the claim 1 hereinabove.

Claim 12 is essentially the same as claim 2 except that it is directed to a computer program product readable by a computer rather than a method (col. 5, lines 44-61; also col. 2, lines 32-42), and is rejected for the same reason as applied to the claim 2 hereinabove.

Claim 13 is essentially the same as claim 3 except that it is directed to a computer program product readable by a computer rather than a method (collection mark-sweep cycle: see fig. 7; also fig. 6, col. 10, lines 8-47, see abstract and fig. 10, col.

11, lines 25-31), and is rejected for the same reason as applied to the claim 3 hereinabove.

Claim 14 is essentially the same as claim 4 except that it is directed to a computer program product readable by a computer rather than a method (col. 10, lines 8-47, col. 11, lines 65-67 and col. 12, lines 1-12), and is rejected for the same reason as applied to the claim 4 hereinabove.

Claim 15 is essentially the same as claim 5 except that it is directed to a computer program product readable by a computer rather than a method (col. 2, lines 57-67 and col. 3, lines 1-45; col. 6, lines 18-33, see fig. 2 and col. 8, lines 9-30; and col. 5, lines 62-67, col. 6, lines 1-7 and col. 11, lines 25-31, see figs. 9 and 10), and is rejected for the same reason as applied to the claim 5 hereinabove.

Claim 16 is essentially the same as claim 6 except that it is directed to a computer program product readable by a computer rather than a method (col. 10, lines 8-47, col. 11, lines 65-67 and col. 12, lines 1-12), and is rejected for the same reason as applied to the claim 6 hereinabove.

Claim 17 is essentially the same as claim 7 except that it is directed to a computer program product readable by a computer rather than a method (abstract, col. 10, lines 65-67 and col. 11, lines 1-25), and is rejected for the same reason as applied to the claim 7 hereinabove.

Claims 18 and 19 are essentially the same as claims 8 and 9 except that they are directed to a computer program product readable by a computer rather than a method

(col. 4, lines 39-59 and col. 6, lines 55-60 and col. 7, lines 1-15), and is rejected for the same reason as applied to the claims 8 and 9 hereinabove.

With respect to claim 20, Kolodner discloses a plurality of garbage collection modules for reclaiming unused memory objects located within the shared memory, each garbage collection module associated with a processing unit, each garbage collection module operates on a dedicated heap of memory (col. 4, lines 50-59 and col. 8, lines 9-20; also see fig. 2, col. 6, lines 55-60 and col. 7, lines 1-15); and a synchronizing module for synchronizing the activities performed by the garbage collection modules (col. 3, lines 25-45; also col. 2, lines 18-32).

Contact Information

4. Any inquiry concerning this communication should be directed to Anh Ly whose telephone number is (703) 306-4527 or via E-Mail: **ANH.LY@USPTO.GOV**. The examiner can be reached on Monday – Friday from 8:00 AM to 4:00 PM.

If attempts to reach the examiner are unsuccessful, see the examiner's supervisor, Kim Vu, can be reached on (703) 305-4393.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to: (703) 746-7238 (after Final Communication)

or: (703) 746-7239 (for formal communications intended for entry)

or: (703) 746-7240 (for informal or draft communications, or Customer Service Center, please label "PROPOSED" or "DRAFT")

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington, VA, Fourth Floor (receptionist).

Inquiries of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 305-3900.

AL
Nov. 27th, 2002.

HOSAIN T. ALAM
PRIMARY EXAMINER